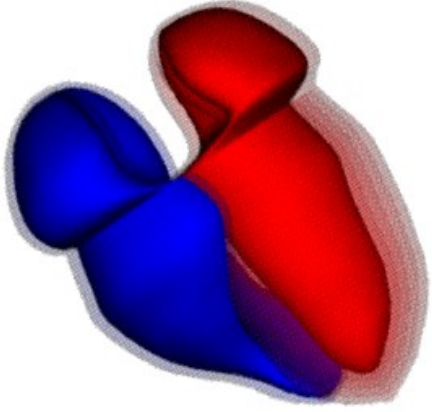




# **Armed Forces College of Medicine AFCM**



# **The Heart I**

## **The Pericardium & External Features of the Heart**

### **By**

### **Prof Azza Kamal**

Anatomy Department/ Cardiopulmonary  
Module/ Prof Azza Kamal



# ILO's

**By the end of this lecture, each student should be able to:**

- 1) **List** the layers of pericardium and their function.
- 2) **List** the blood supply and nerve supply of the layers of pericardium .
- 3) **Locate** site of the pericardial sinuses and their clinical significance.
- 4) **Discuss** the relevant applied anatomy of the pericardium .
- 5) **Describe** the external features of the heart (position, surfaces & borders)

# Key Points in the Lecture

## **I) The Pericardium:**

- 1. Layers**
- 2. Function**
- 3. Blood supply**
- 4. Nerve supply**
- 5. Pericardial sinuses**
- 6. Applied anatomy**

## **II) The Heart:**

- 1. Position, surfaces & borders**
- 2. Surface anatomy**



# The Pericardium



- **Fibrous sac which surrounds the heart & the roots of its big vessels**

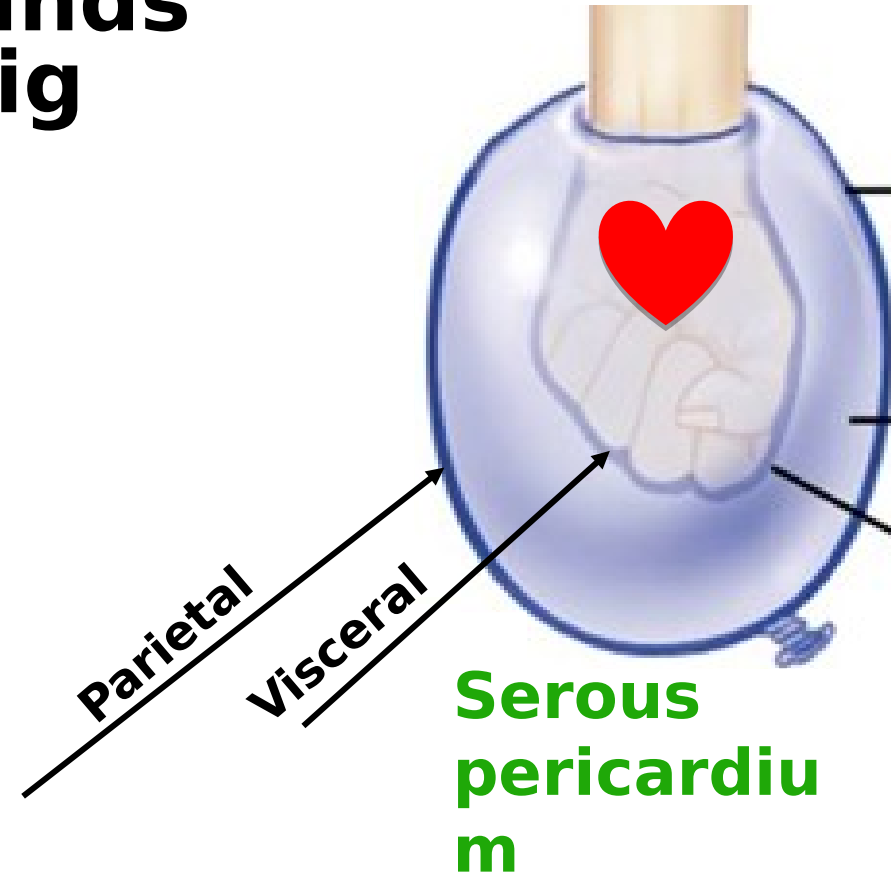
**It consists of 2 sacs :**

**1. Outer fibrous sac □ fibrous pericardium**

**2. Inner double layered sac □ serous pericardium**

**visceral**

**parietal**

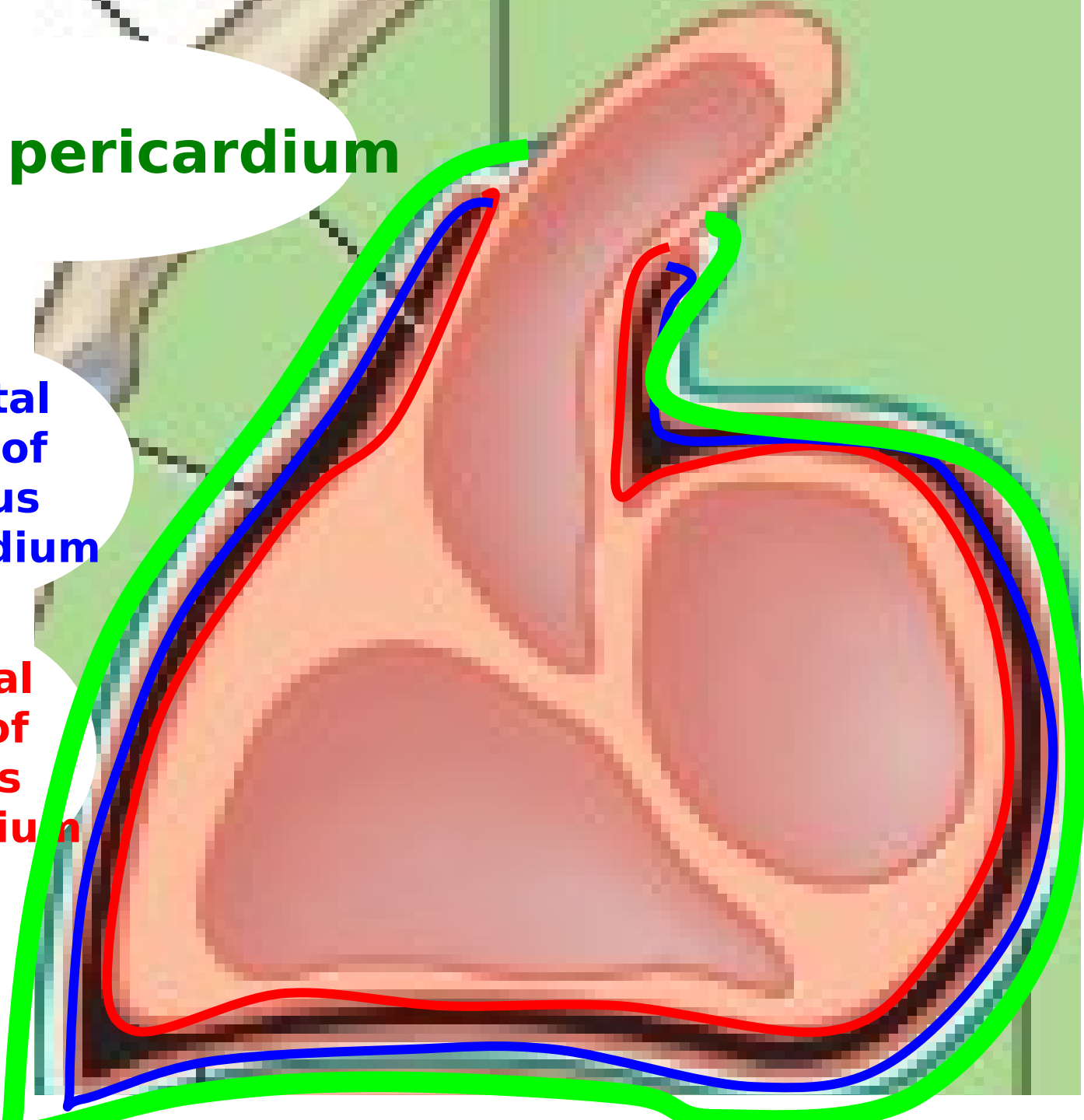


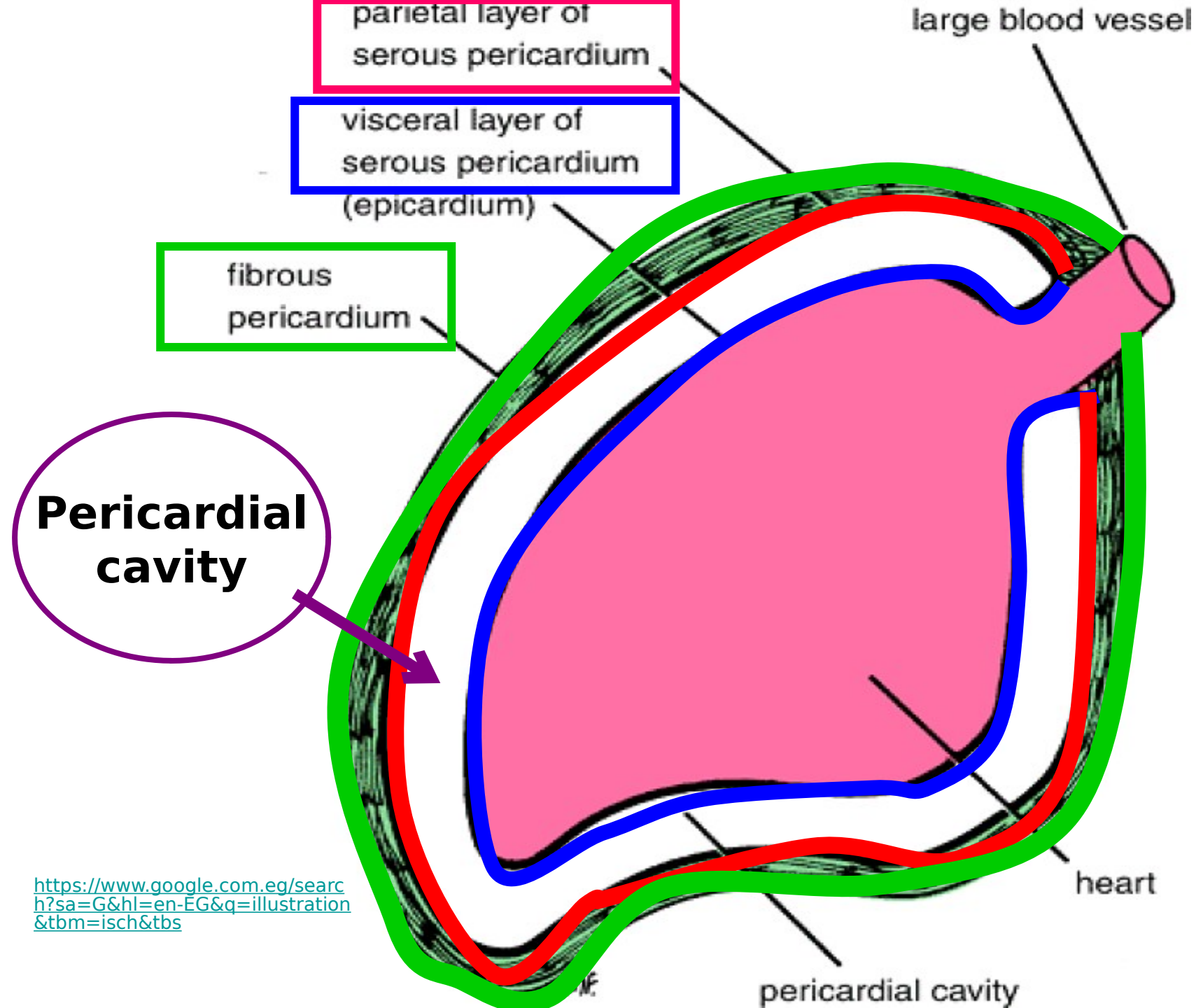


# Fibrous pericardium

Parietal  
Layer of  
Serous  
pericardium

Visceral  
Layer of  
Serous  
pericardium





<https://www.google.com.eg/search?sa=G&hl=en-EG&q=illustration&tbm=isch&tbs>

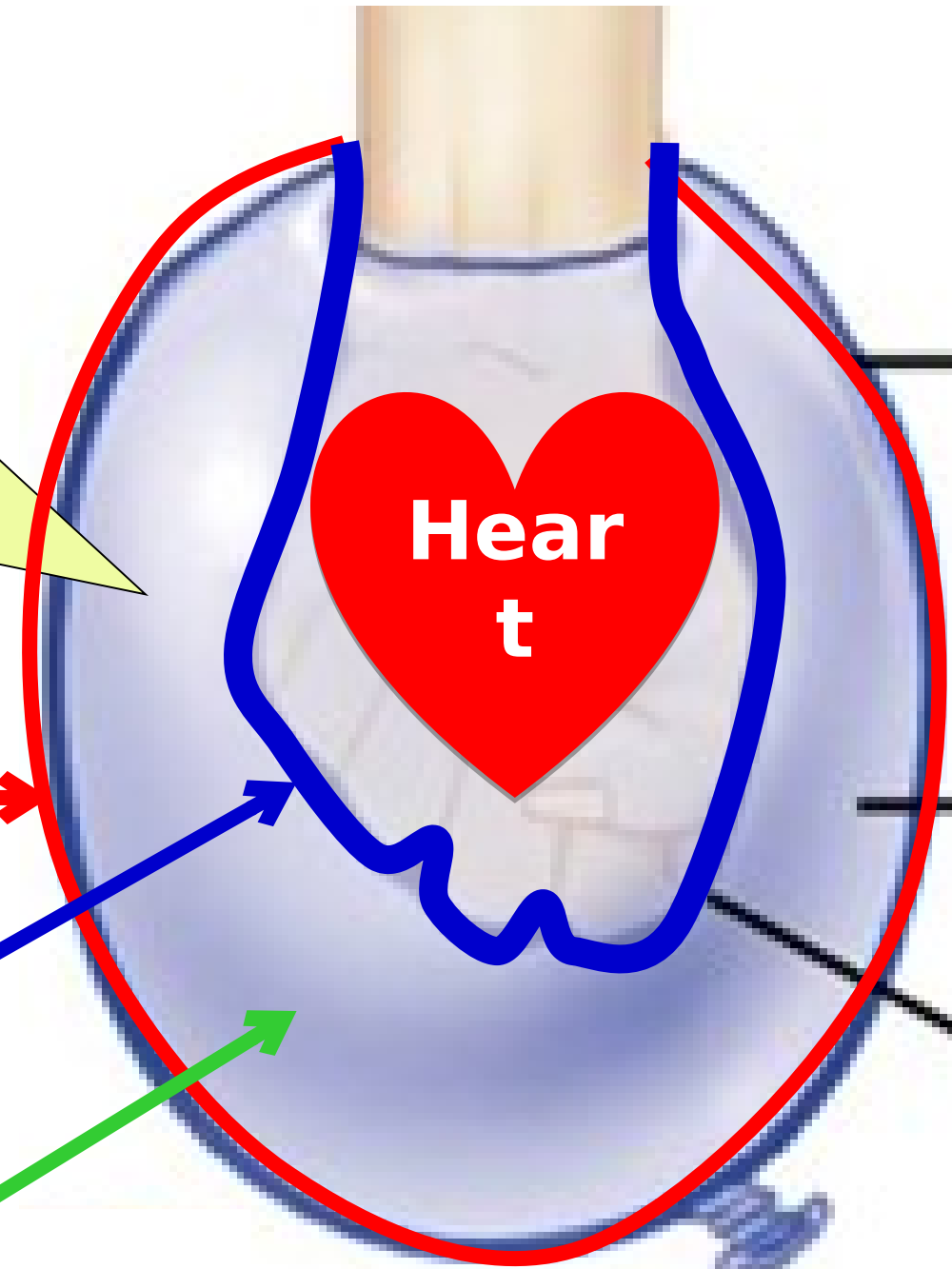


**Serous**  
pericardium is  
like the balloon  
and the heart is  
like the hand  
pushing into the  
balloon

**Parietal layer**

**Visceral layer**

**Pericardial cavity**



**Which of the following is the outermost layer of the pericardium that covers the heart and the roots of its big blood vessels?**

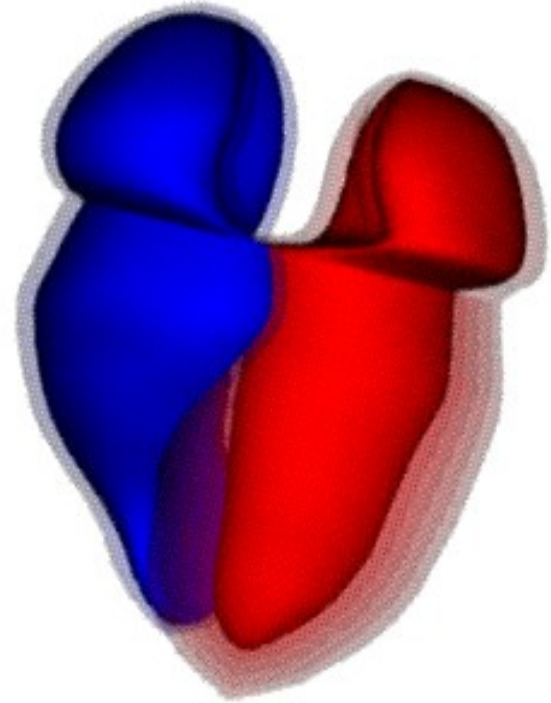
- a)Visceral layer of serous pericardiu
- ☒ b)Parietal layer of serous pericardiu
- c)Fibrous pericardium
- d)Myocardium
- e)Endocardium

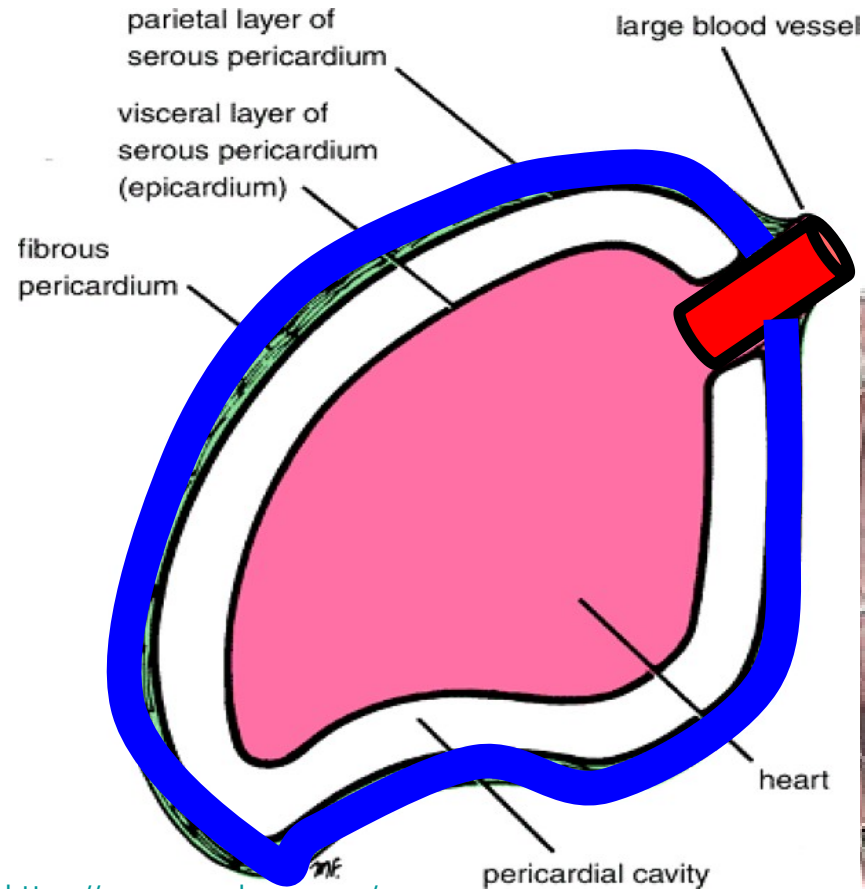


**MCQ to test layers of the pericardium**

# Functions of the fibrous pericardium

- 1. Maintains a constant position for the heart**
- 2. Being non elastic, it prevents over distension of the heart**
- 3. Keeps the mouths of blood vessels opened not affected by cardiac or respiratory movements**

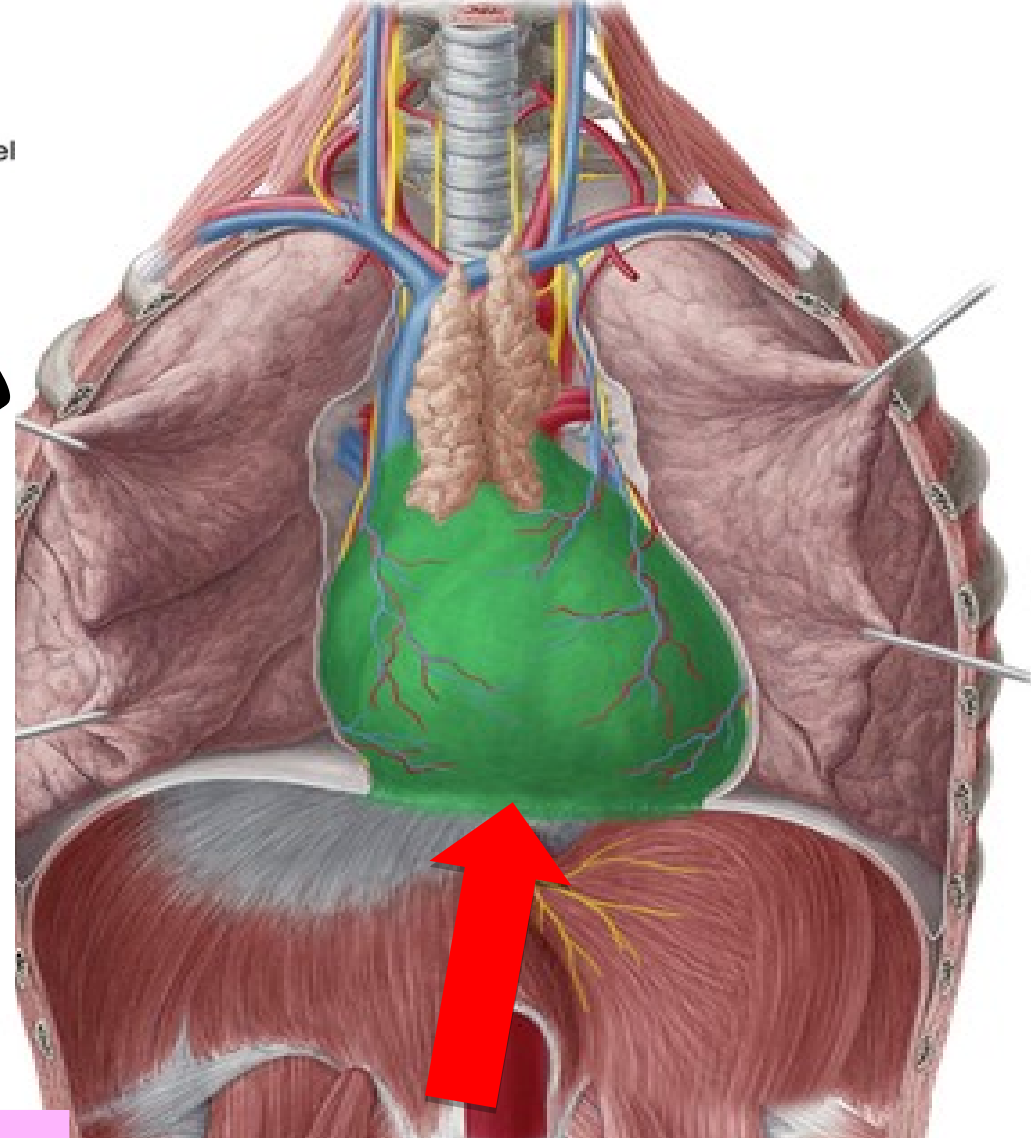




<https://www.google.com/eg/search?sa=G&hl=en-EG&q=illustration&tbm=isch&tbs>

**Fibrous pericardium blends with adventitia of big vessels**

Mt



**Fibrous pericardium is attached to diaphragm**





<https://lh3.googleusercontent.com/UWnO7M>



- **Functions of the serous pericardium:**
  - 1. Lubrication of the heart preventing friction during its movements**
  - 2. Prevents adhesions between the heart & the surrounding organs**



**Which of the following is a function of the serous pericardium?**

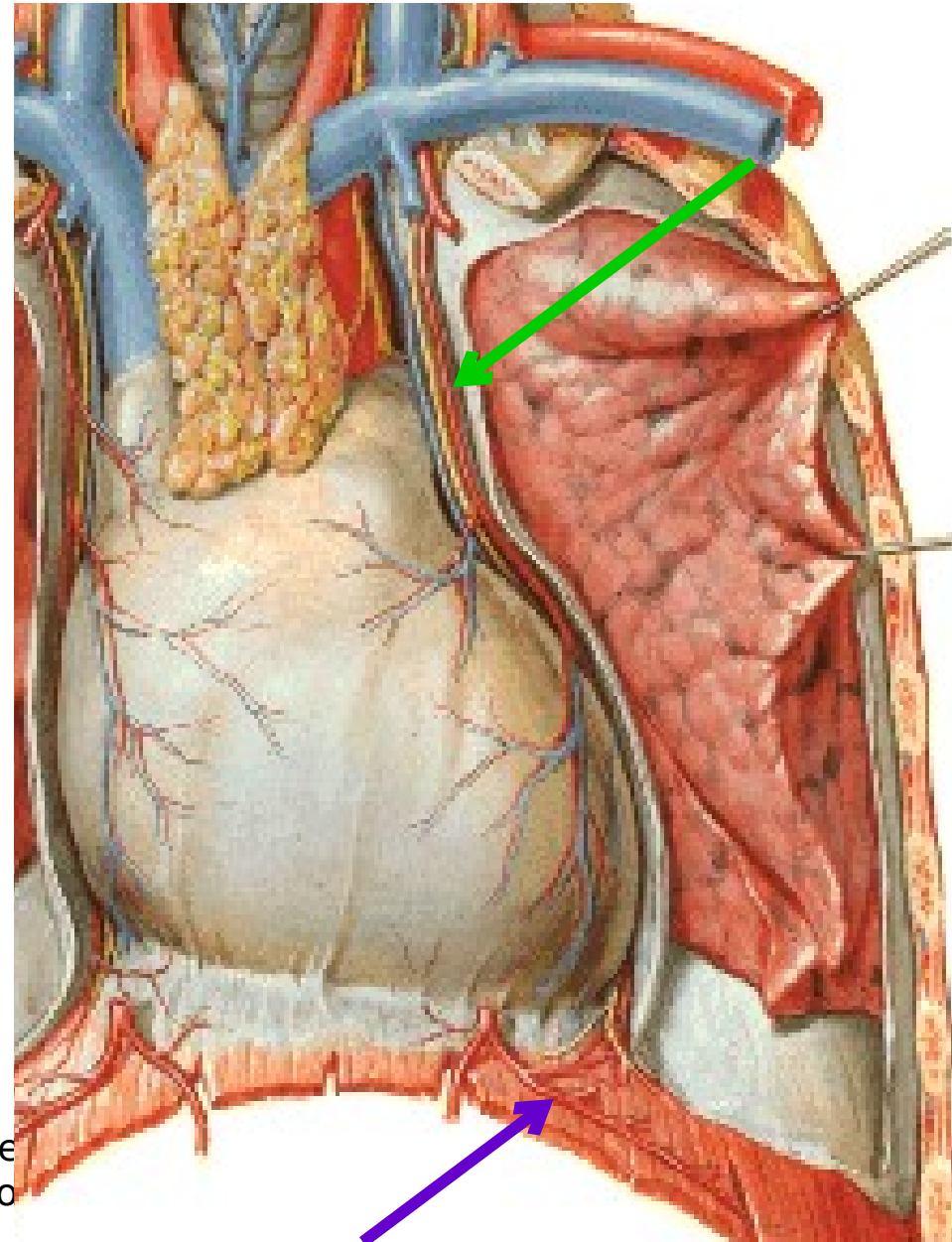


- ☒ a) Prevents over distension of the heart
- b) Lubrication of the heart preventing friction during its movement
- c) Maintains a constant position for the heart
- d) Keeps mouths of blood vessels opened not

**MCQ to test functions of the pericardium**

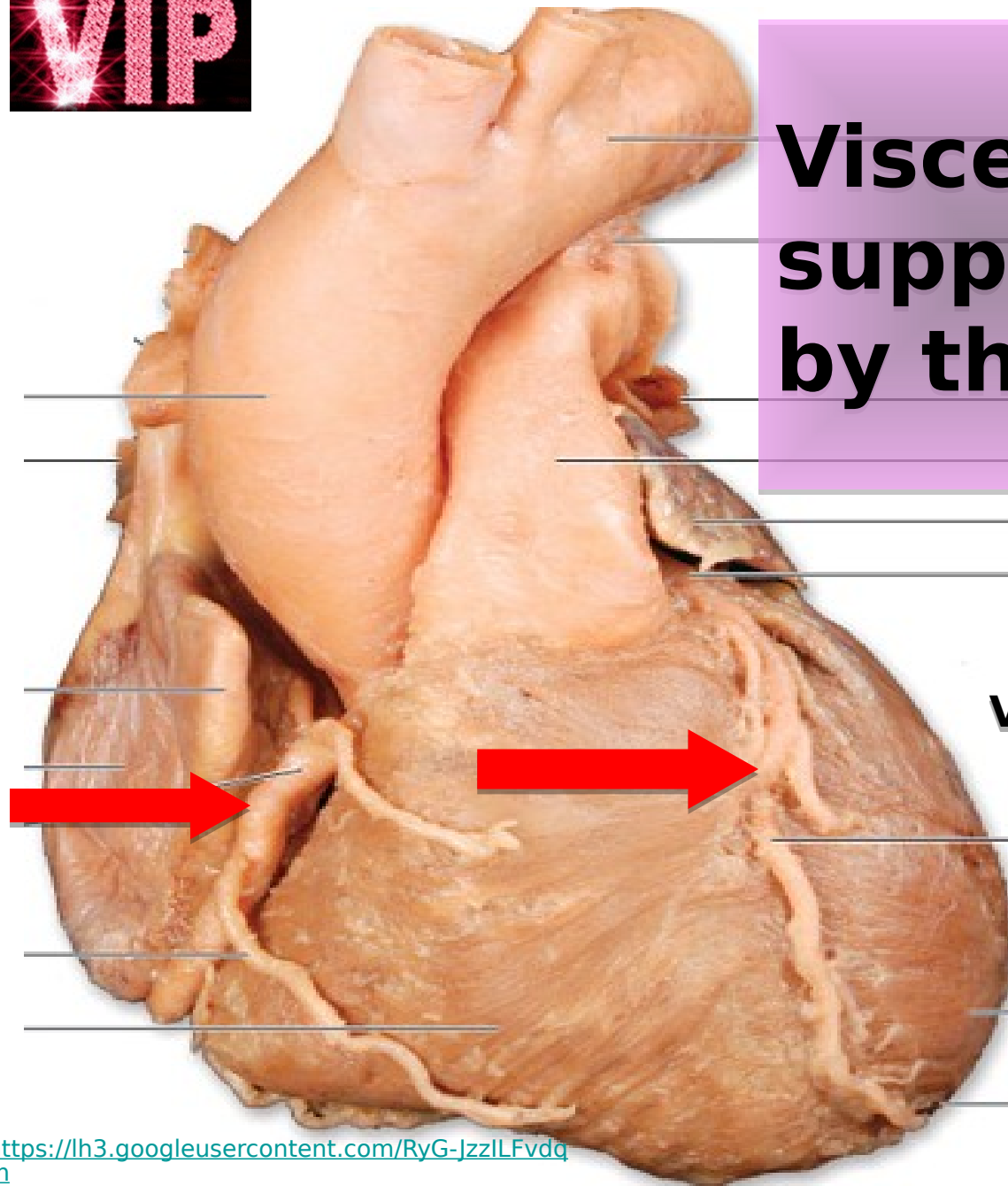
- **Fibrous pericardium & parietal serous pericardium are supplied by brs from:**

- 1. Pericardiophrenic artery**
- 2. Musculophrenic a**
- 3. Descending**

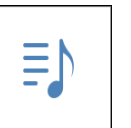


**VIP**

**Visceral pericardium is supplied like the heart by the coronary arteries**



**VEINS FROM PERICARDIUM  
ENTER  
THE AZYGOS  
SYSTEM OF VEINS**



**Which of the following arteries  
supplies**

**① the visceral layer of serous  
pericardium?**

- a) Coronaries
- b) Pericardiophrenic
- c) Musculophrenic

**MCQ to test blood supply of the pericardium**

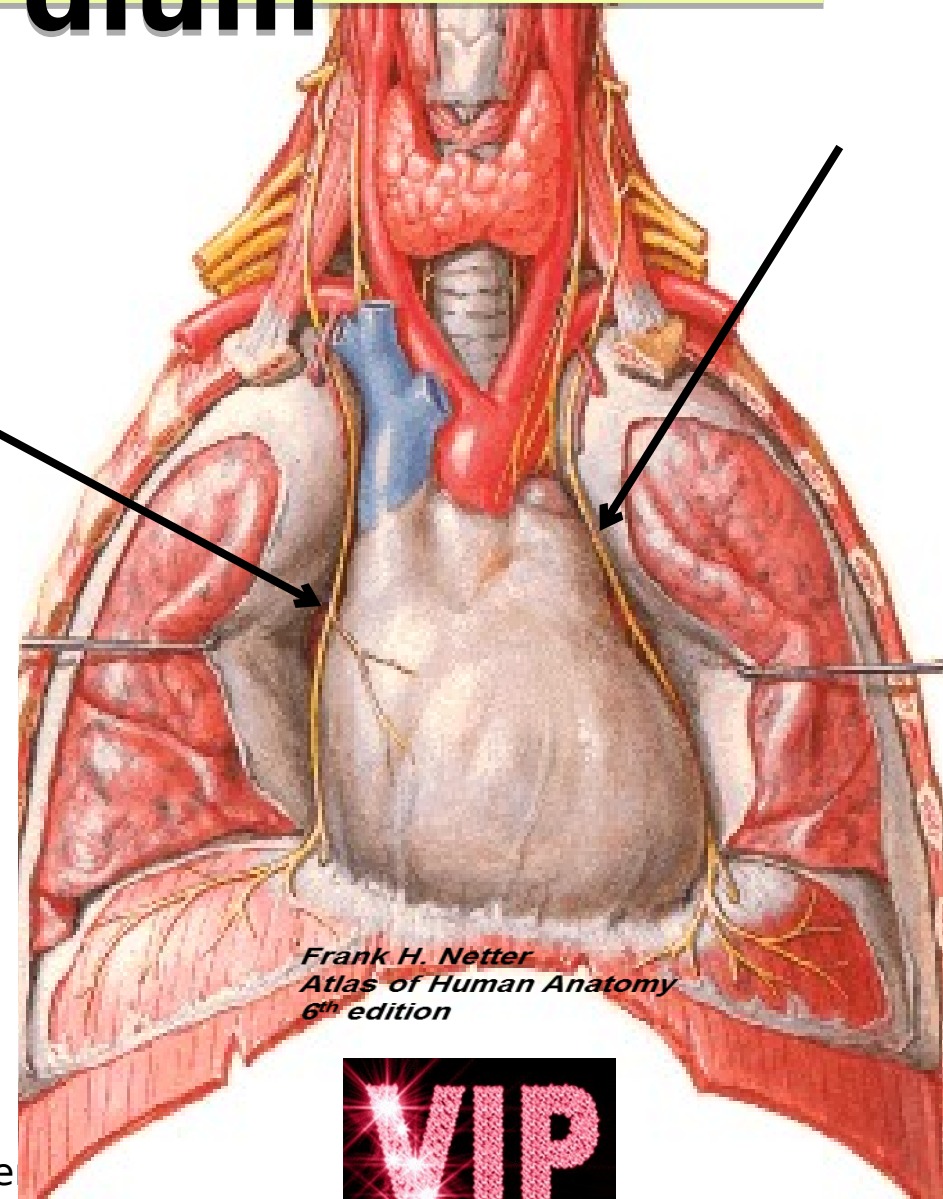
d) Descending thoracic aorta



# Nerve supply of the pericardium

- **Fibrous pericardium & parietal serous pericardium** are supplied by the phrenic nerves. They are **sensitive to pain**

- **Visceral layer of serous pericardium** is like the heart supplied by autonomic nerves (sympathetic & parasympathetic) . It is **not sensitive to pain**



**A patient is diagnosed with inflammation in one of the layers of the pericardium. He doesn't complain of pain. Which layer is **most likely affected?****



- a) Fibrous pericardium
- b) Visceral layer of serous pericardium
- c) Parietal layer of serous pericardium
- d) All three layers of the pericardium

**MCQ to test nerve supply of the pericardium**

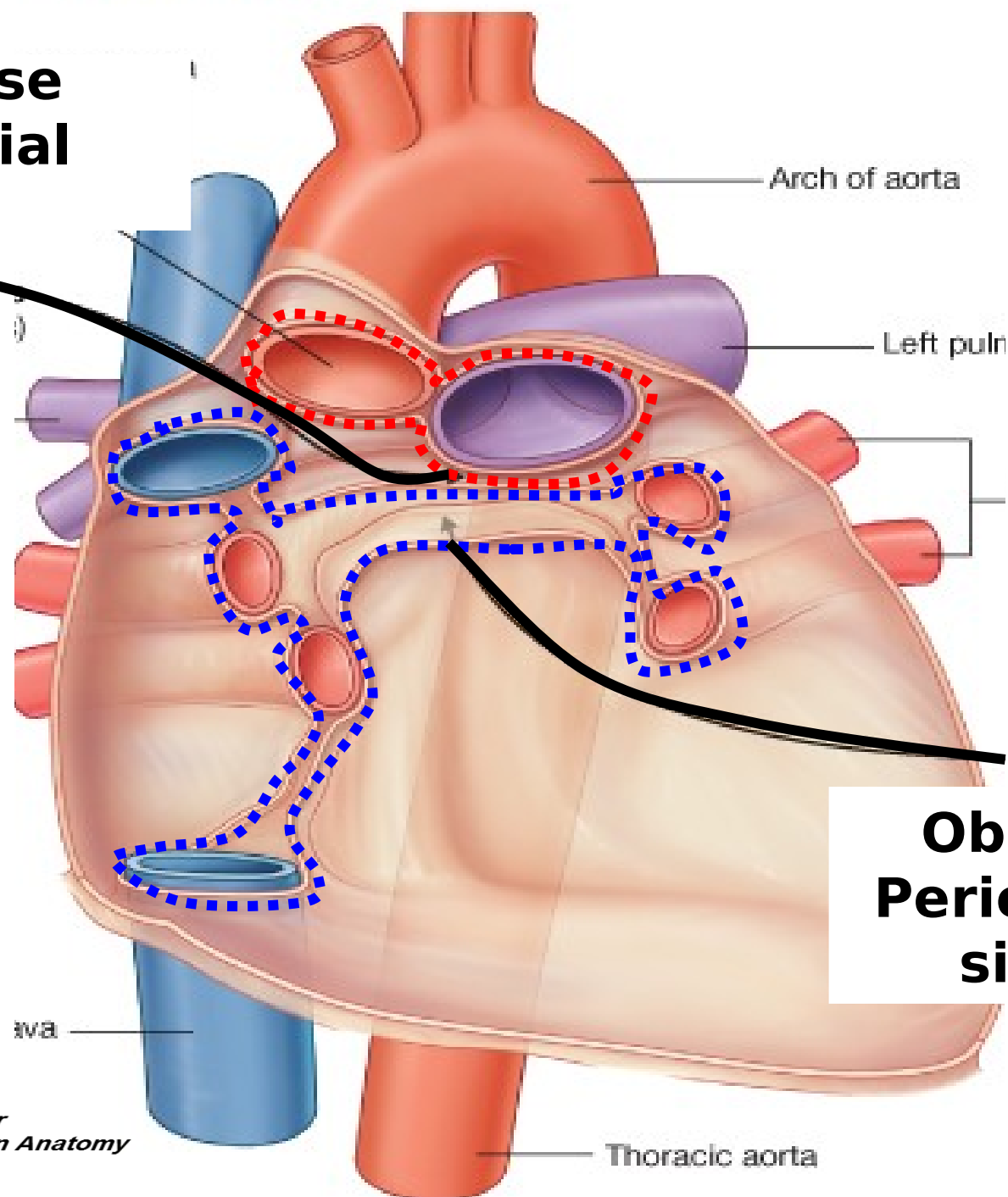
# Pericardial Sinuses

- These are recesses inside the pericardial cavity
- Visceral layer of serous pericardium forms 2 tubes around the roots of big vessels
- **A tube around arteries ( aorta & pulmonary trunk)**
  - ▮ Transverse sinus is the passage between the 2 tubes
- **A tube around veins (pulmonary veins, SVC & IVC)**
  - ▮ Oblique sinus is the recess behind the venous





**Transverse  
Pericardial  
sinus**

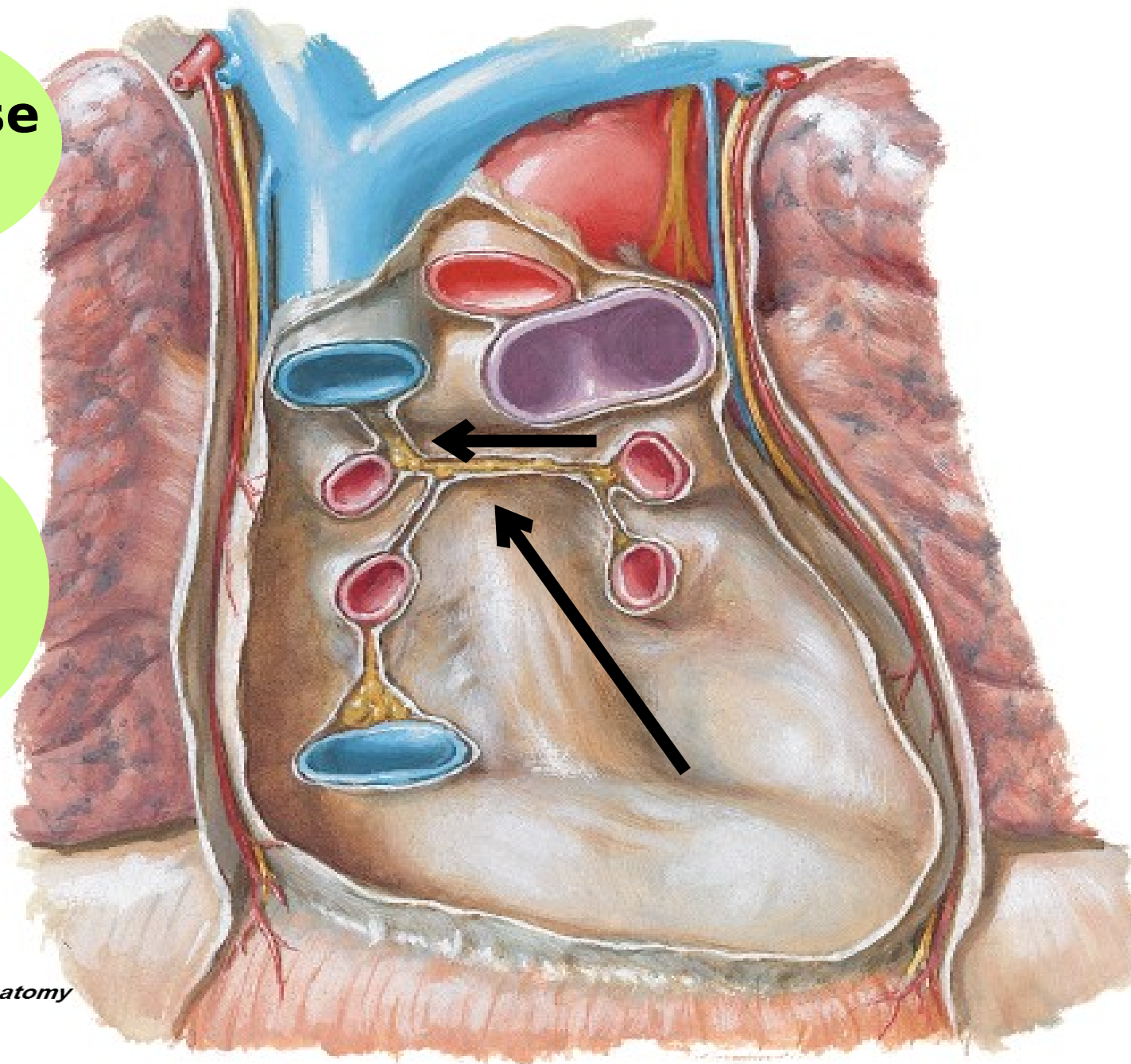






**Transverse  
sinus**

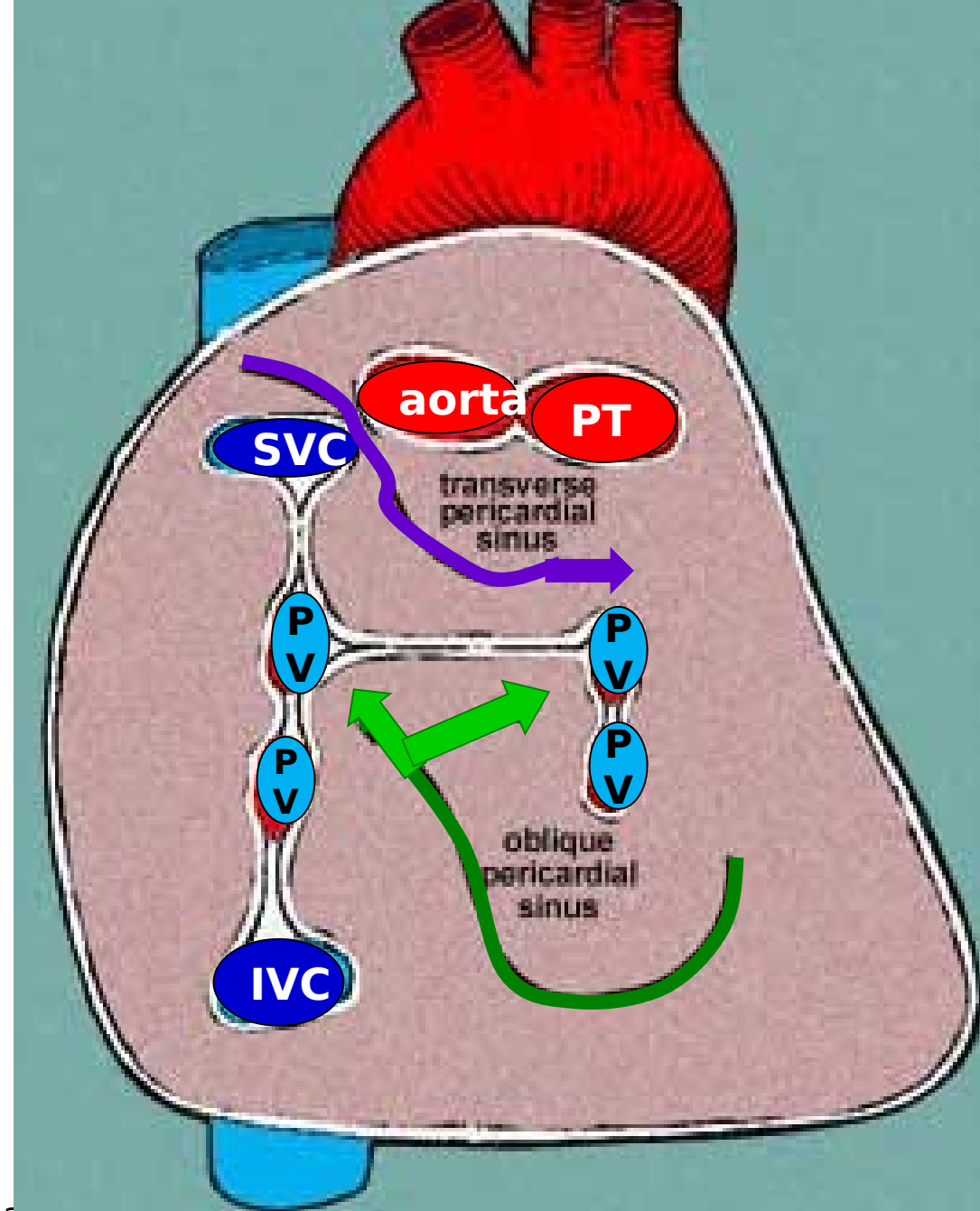
**Oblique  
sinus**



*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*



- **Transverse sinus** = lies anterior to SVC and posterior to aorta + pulmonary trunk
- **Transverse sinus** provides space for distension of ascending aorta & pulmonary trunk during increased cardiac output.
- **Oblique sinus** = lies posterior to the left atrium



**The oblique pericardial sinus lies posterior to which of the following cardiac chambers?**

a) Right ventricle

b) Right atrium

☒ c) Left ventricle

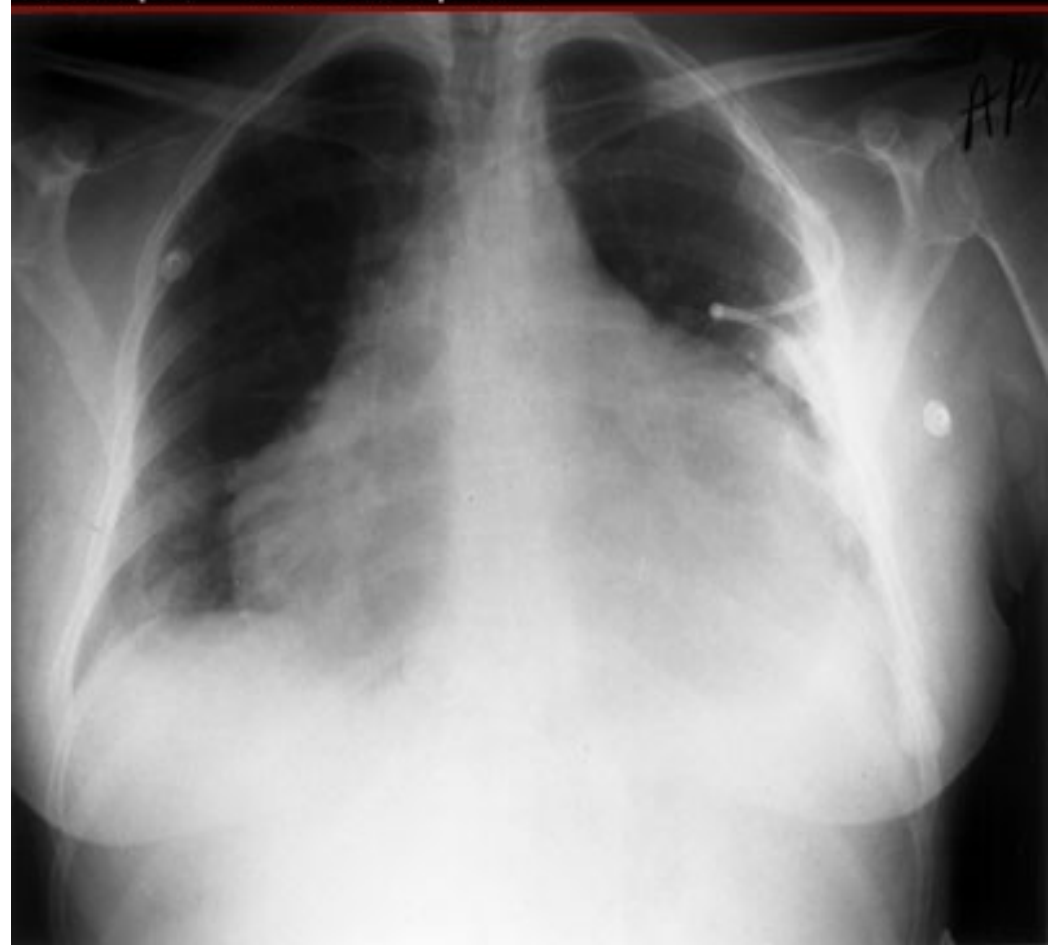
d) Left atrium

**MCQ to test sinuses of the pericardium**



# Applied Anatomy

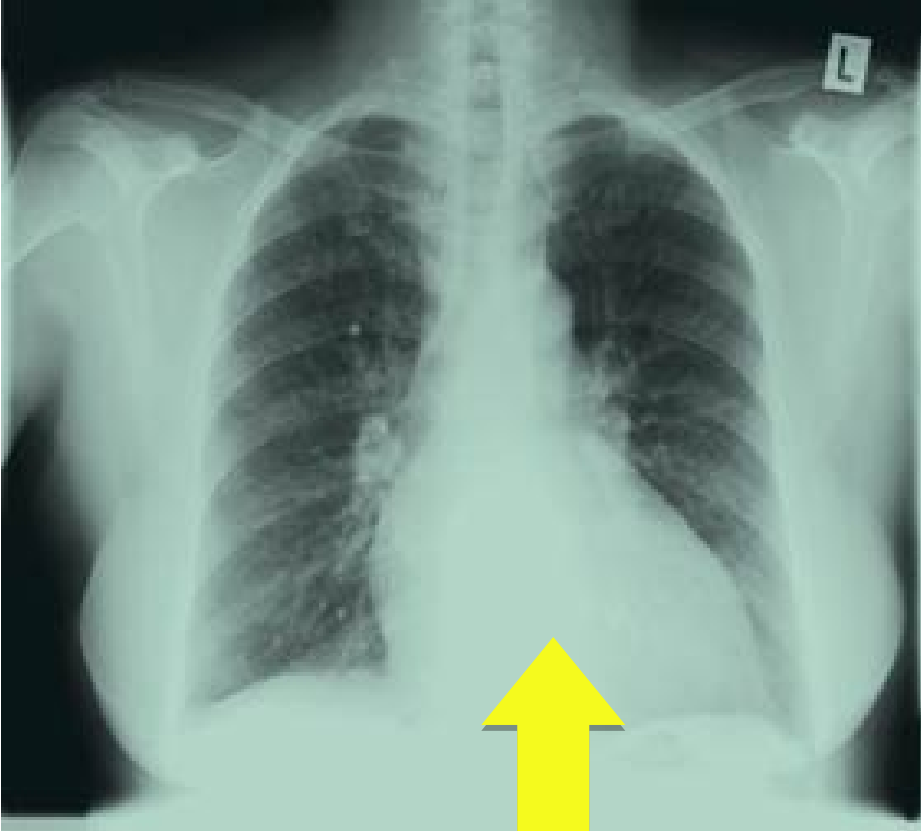
- **Pericarditis** is inflammation of the pericardium.
- It causes substernal pain & produces **pericardial effusion** (fluid in the pericardial cavity)
- If effusion is **extensive**, it may



<https://www.google.com.eg/search?sa=G&hl=en-EG&q=effects+of+phosgene>

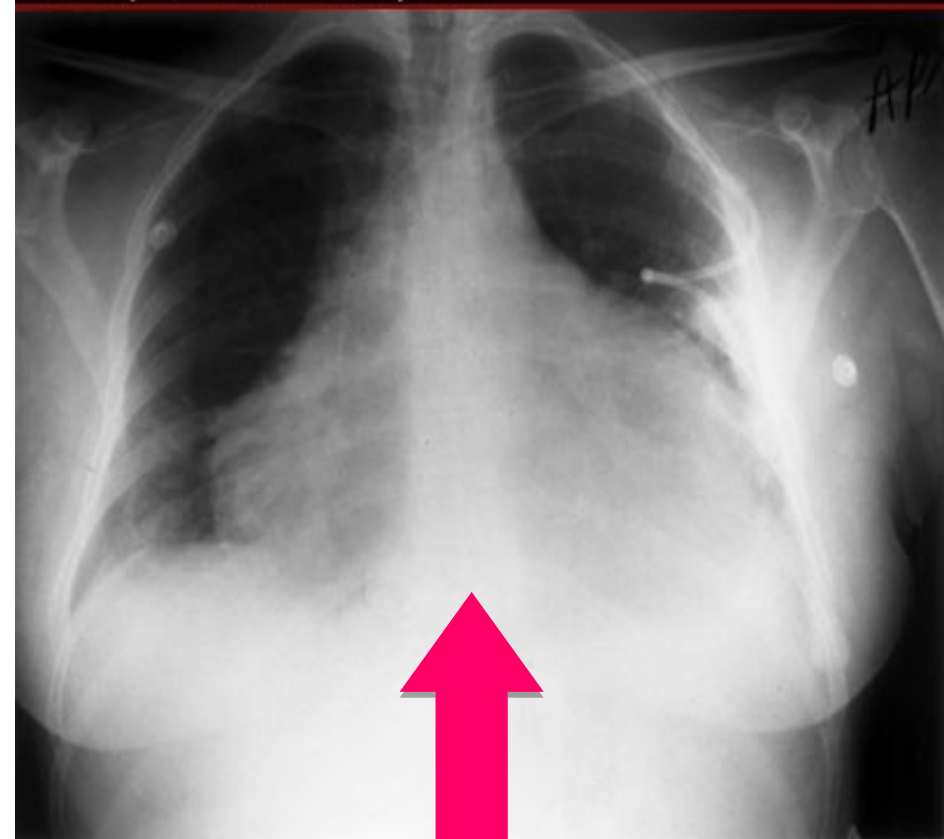


## Normal cardiac shadow



<https://lh3.googleusercontent.com/9YuFaG3FxBSqnrQd>

## Huge cardiac shadow due to Pericardial effusion

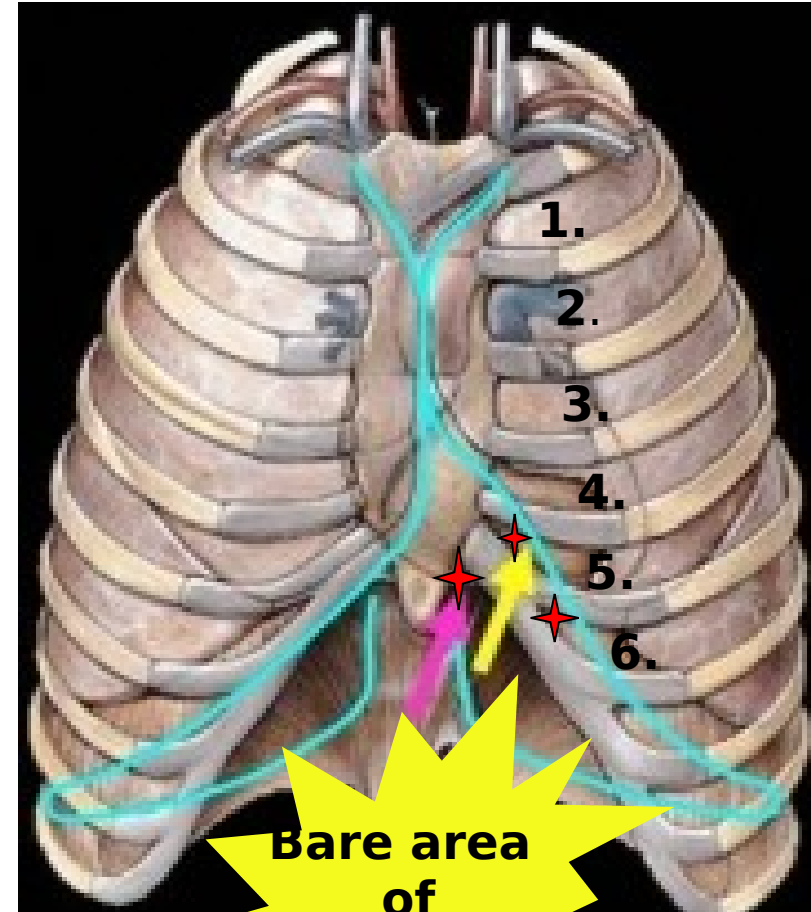


<https://www.google.com.sg/search?sa=G&hl=en-EG&q=effects+of+phosgene>

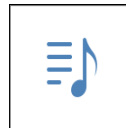


# Pericardial puncture (Pericardiocentesis)

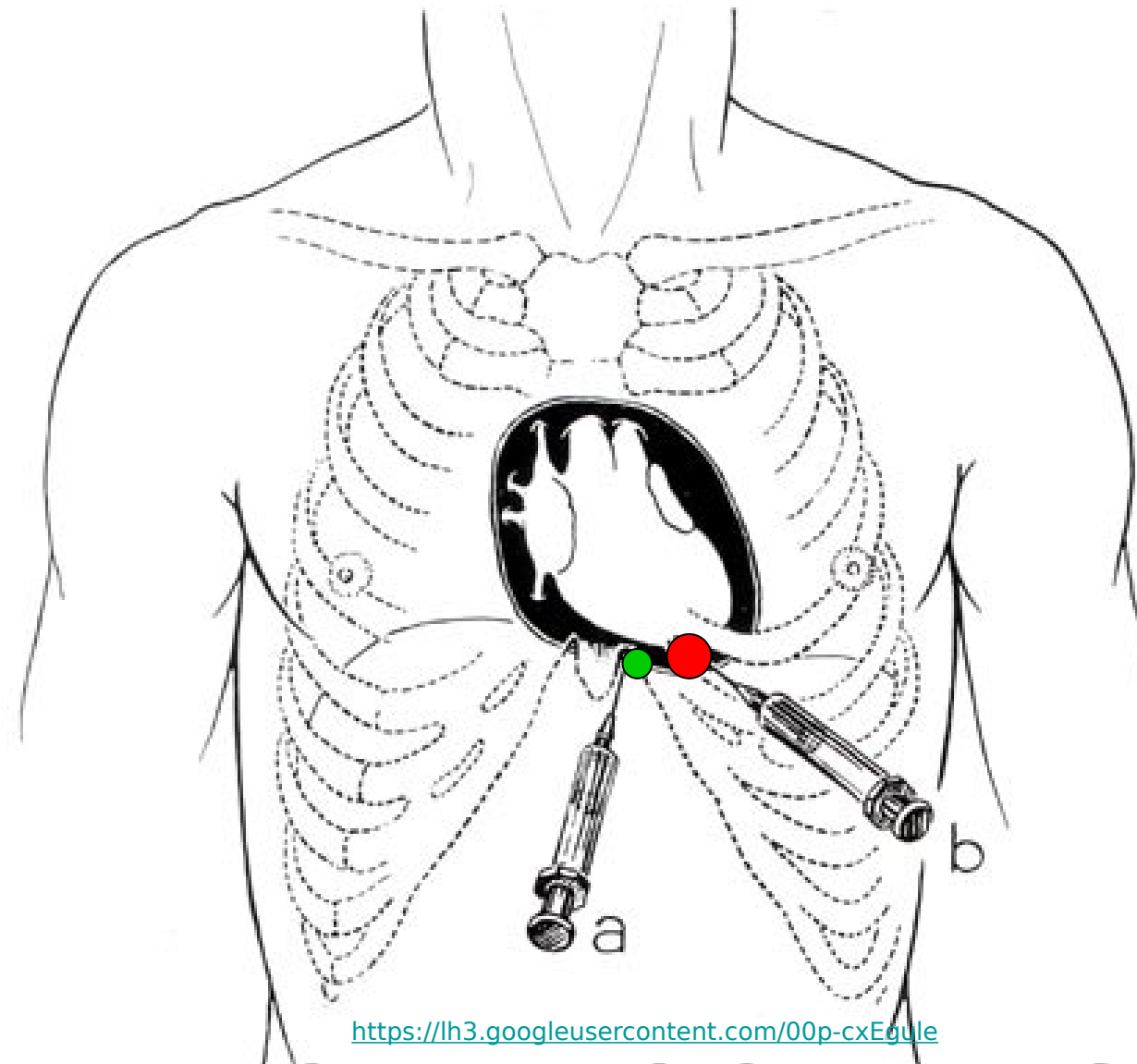
- Draining of fluid from the pericardial cavity is sometimes necessary to relieve pressure of the accumulated fluid on the heart
- A wide bore needle is inserted in the **left 5<sup>th</sup> or 6<sup>th</sup> space close to the sternum** to avoid injury to left pleura & lung.
- Also the **left costoxiphoid angle** is another safe site for



Bare area  
of  
Pericardium



[https://lh3.googleusercontent.com/qKUP2mS\\_YPznIVwsyRIKz](https://lh3.googleusercontent.com/qKUP2mS_YPznIVwsyRIKz)



<https://lh3.googleusercontent.com/00p-cxEgule>

# *PERICARDIOCENTESIS*

Anatomy Department/ Cardiopulmonary  
Module/ Prof Azza Kamal

- A 26-year-old male is brought into the emergency room after having been kicked in the chest by a horse. After examination, it is concluded that the most likely immediate danger is cardiac tamponade (cardiac compression due to bleeding into the pericardial sac). You prepare to draw off the blood from the pericardial sac to relieve the pressure on the heart. Which of the following is the safest site to insert the needle in order to avoid injuring the pleura ?

A. Just below the nipple on the left

B. Left costo-xiphoid angle

C. Near the sternal angle

D. Through the jugular notch

E. 4th left intercostal space in the midaxillary



MCQ to test applied anatomy of the pericardium



# SUMMARY

Visceral of serous	Parietal of serous	Fibrous pericardium	Layers of Pericardium
Coronary arteries like the heart	1) Pericardiaco-phrenic a 2) Musculophrenic a 3) Descending thoracic aorta	1) Pericardiaco-phrenic a 2) Musculophrenic a 3) Descending thoracic aorta	<b>Blood Supply</b>
<b>Autonomic supply like the heart (not sensitive to pain)</b>	<b>Phrenic nerve (Sensitive to pain)</b>	<b>Phrenic nerve (Sensitive to pain)</b>	<b>Nerve Supply</b>

- **Transverse pericardial sinus** lies behind the ascending aorta & pulmonary trunk.
- **Oblique pericardial sinus** lies behind the left atrium
- **Pericardiocentesis** is best done in □ left 5<sup>th</sup> or left 6<sup>th</sup> intercostal space □ to the sternum/ left costo-xiphoid angle



# THE HEART



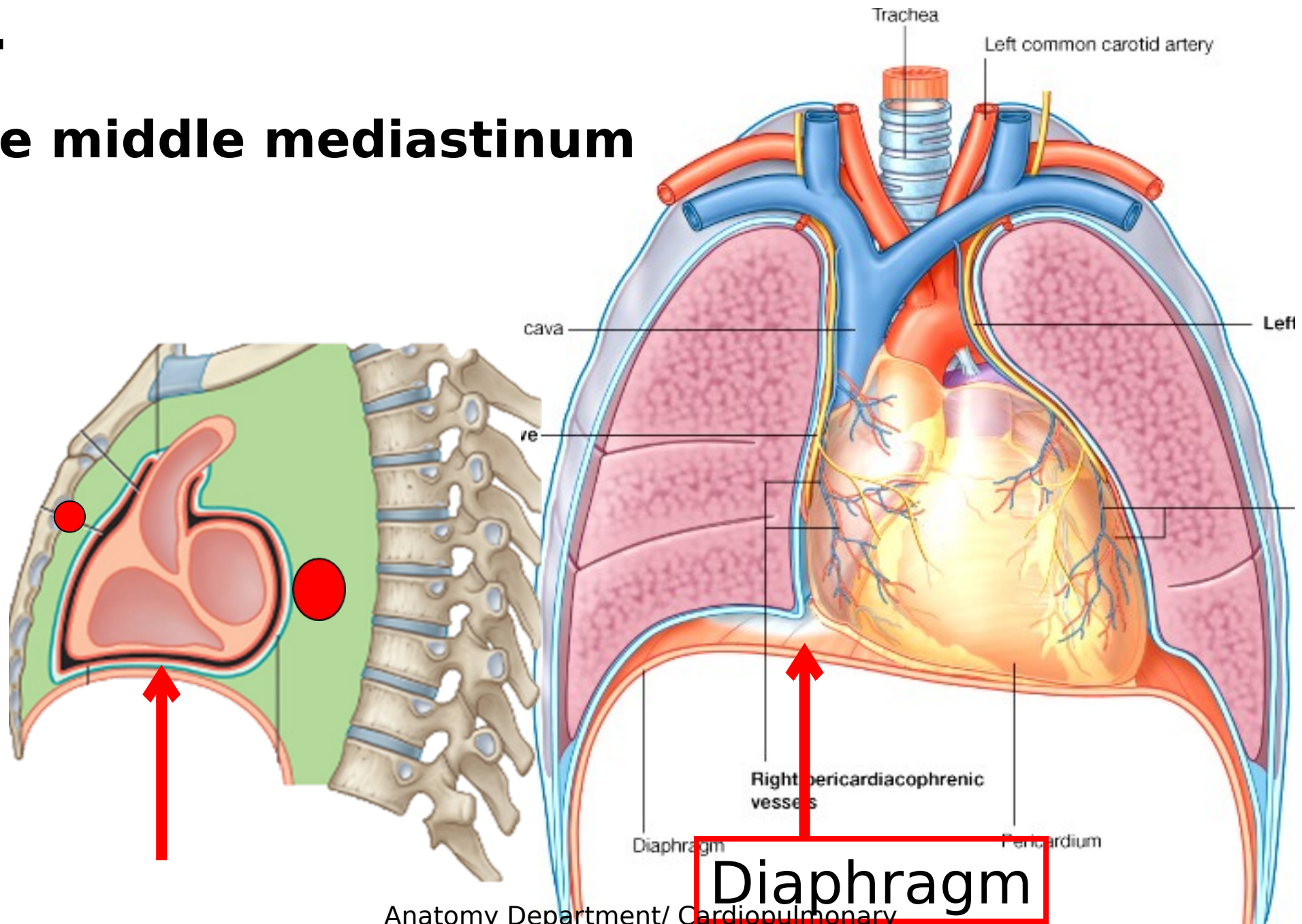
- It is a hollow muscular organ that pumps blood to all organs of the body.

**Size :**  
slightly  
larger  
than a  
clenched  
fist



# HEART

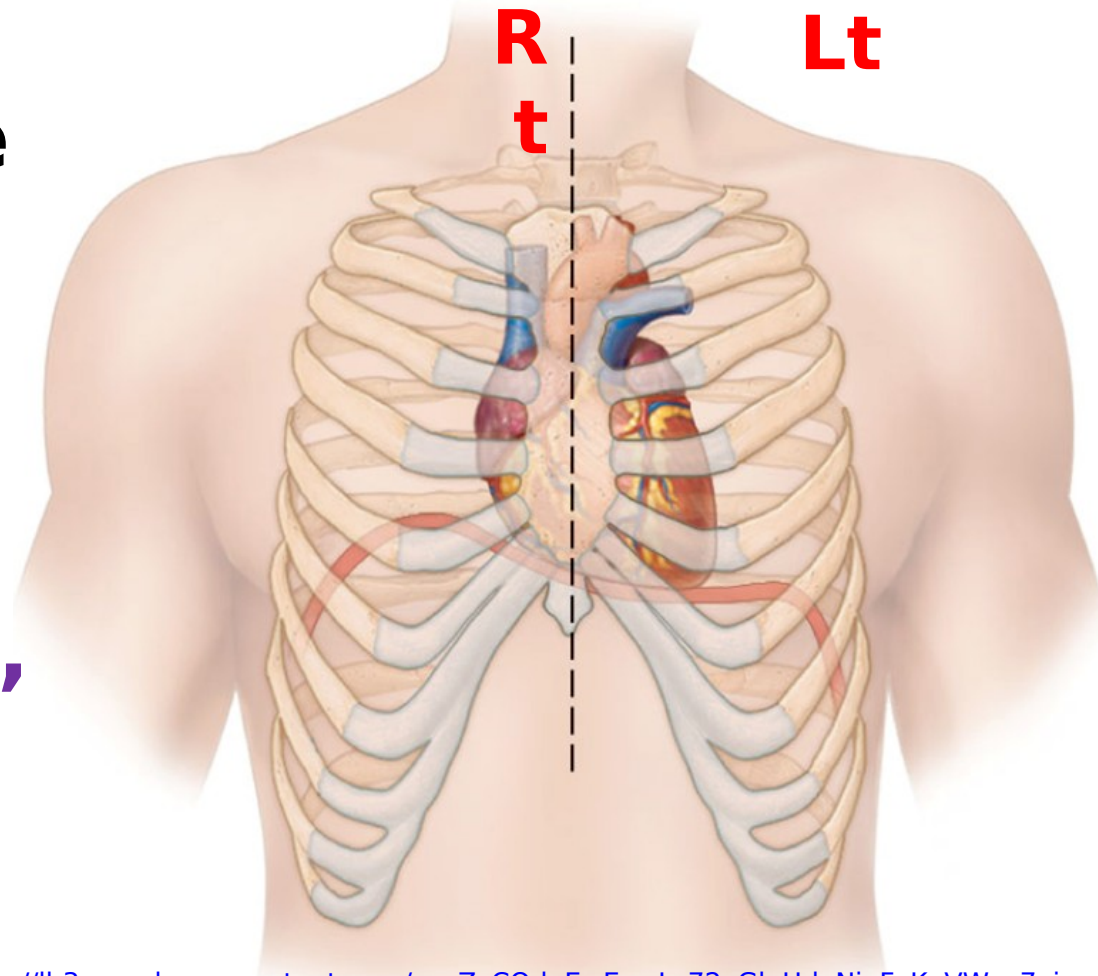
lies in the middle mediastinum



# Position of the heart



- ❑ The heart is placed **obliquely** behind the body of the sternum and adjoining costal cartilages.
- ❑ Its long axis is directed **downwards, forwards & to the left.**
- ❑ It rests on the diaphragm, **1/3 of it**



[https://lh3.googleusercontent.com/xg\\_ZcCOdnEwErq-Jw72vGlgHdoNjpFoKpVWce7xjse](https://lh3.googleusercontent.com/xg_ZcCOdnEwErq-Jw72vGlgHdoNjpFoKpVWce7xjse)

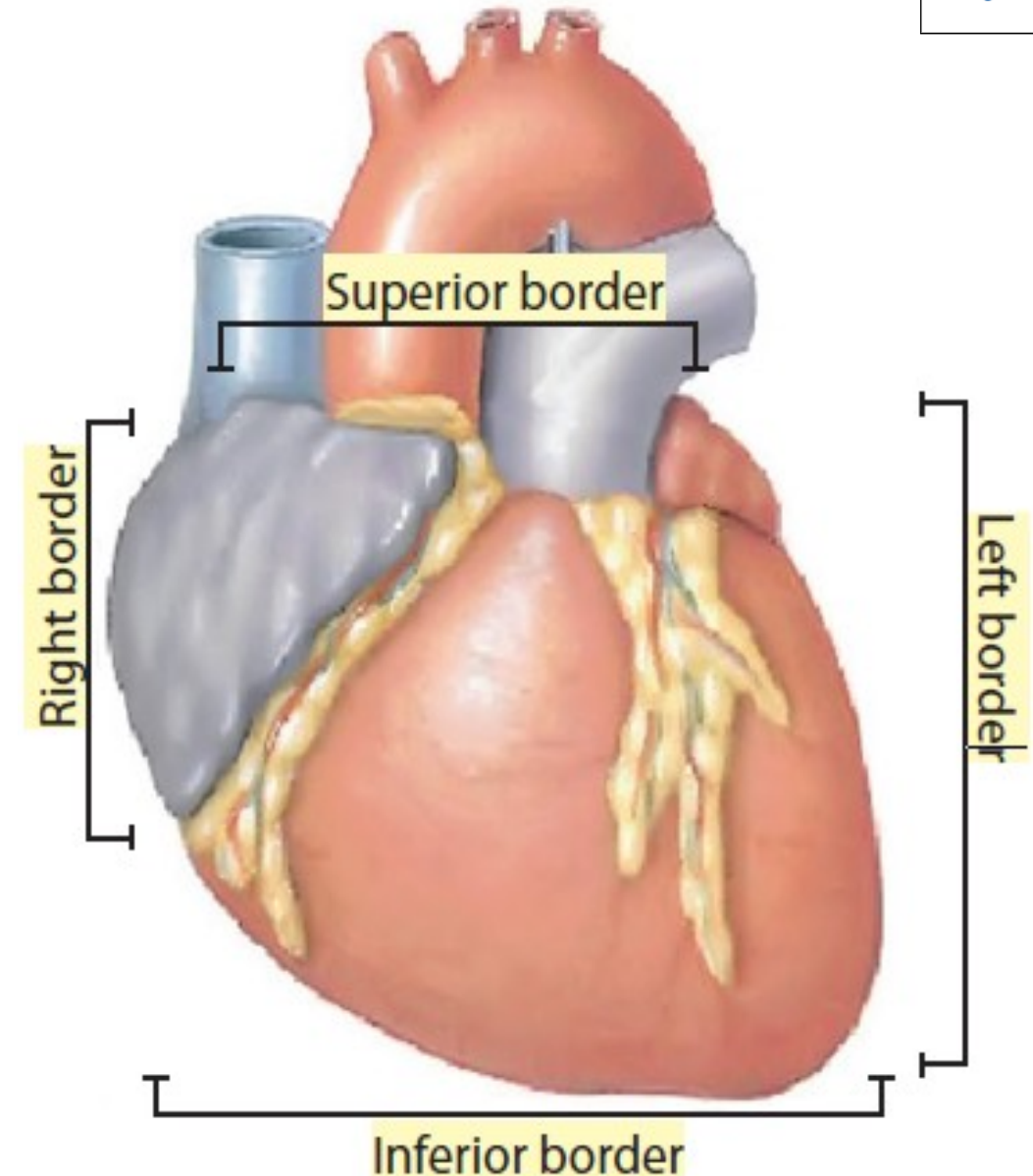




# External Features

:The Heart has

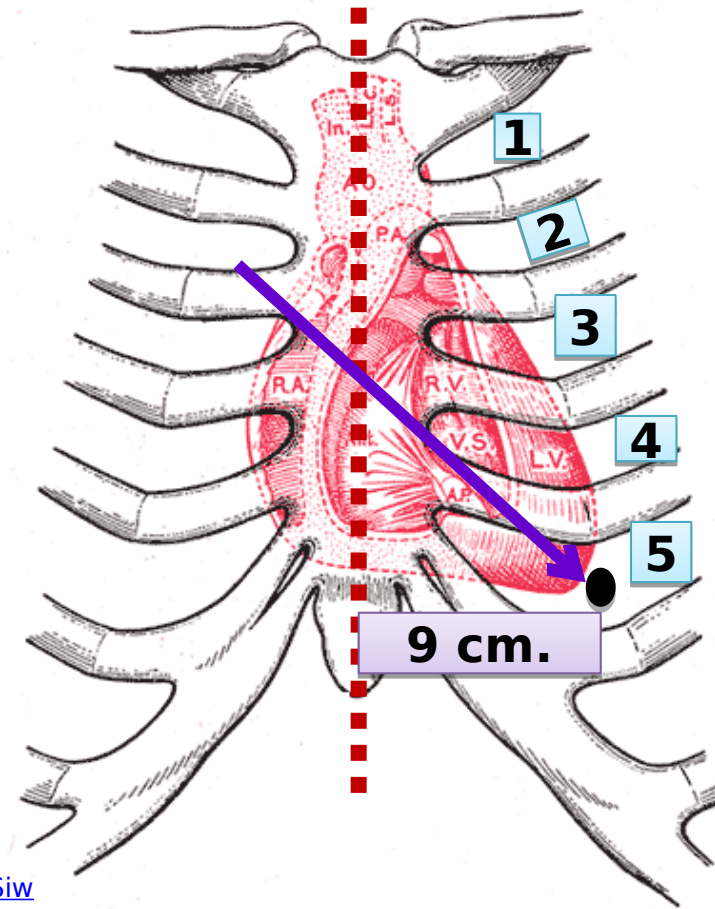
- ❖ Apex and base
- ❖ Two surfaces □ sternocostal & diaphragmatic
- ❖ Four borders □ Right , left, superior & inferior
- ❖ Four grooves □ anterior interventricular/ posterior interventricular/ atrioventricular and interatrial



# Apex of the heart



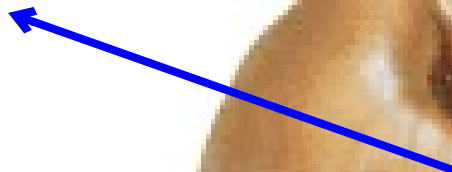
- ❖ Is directed **downwards, forwards and to the left.**
- ❖ Is overlapped by the left lung and pleura.
- ❖ **Is formed by the left ventricle.**
- ❖ Lies in the left 5th intercostal space, approximately 9 cm from the median plane.





# Chambers of The Heart

**Right auricle**



**Rt atrium**

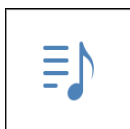
**Left atrium**

**left auricle**



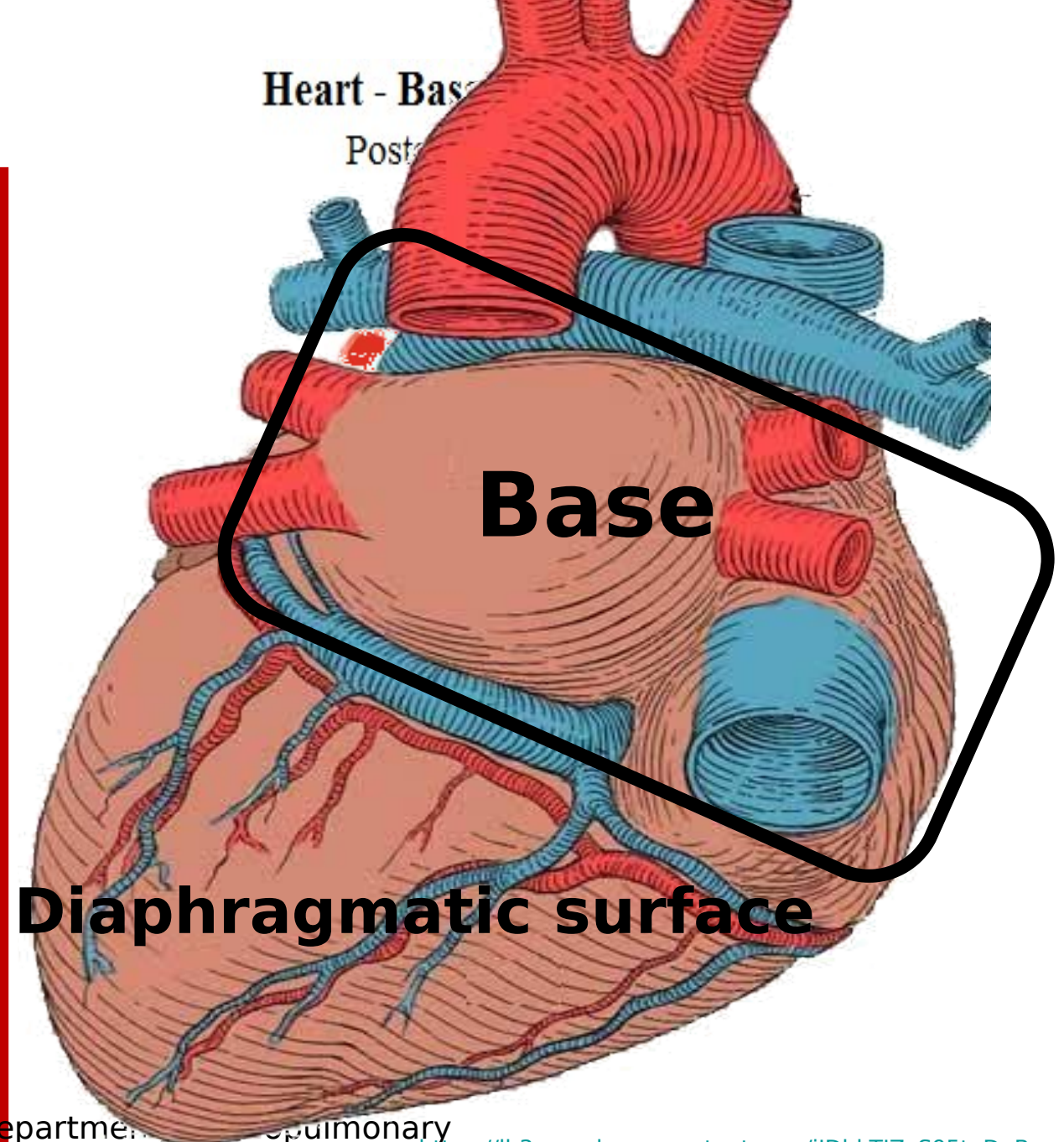
**Right Ventricle**

**Left Ventricle**



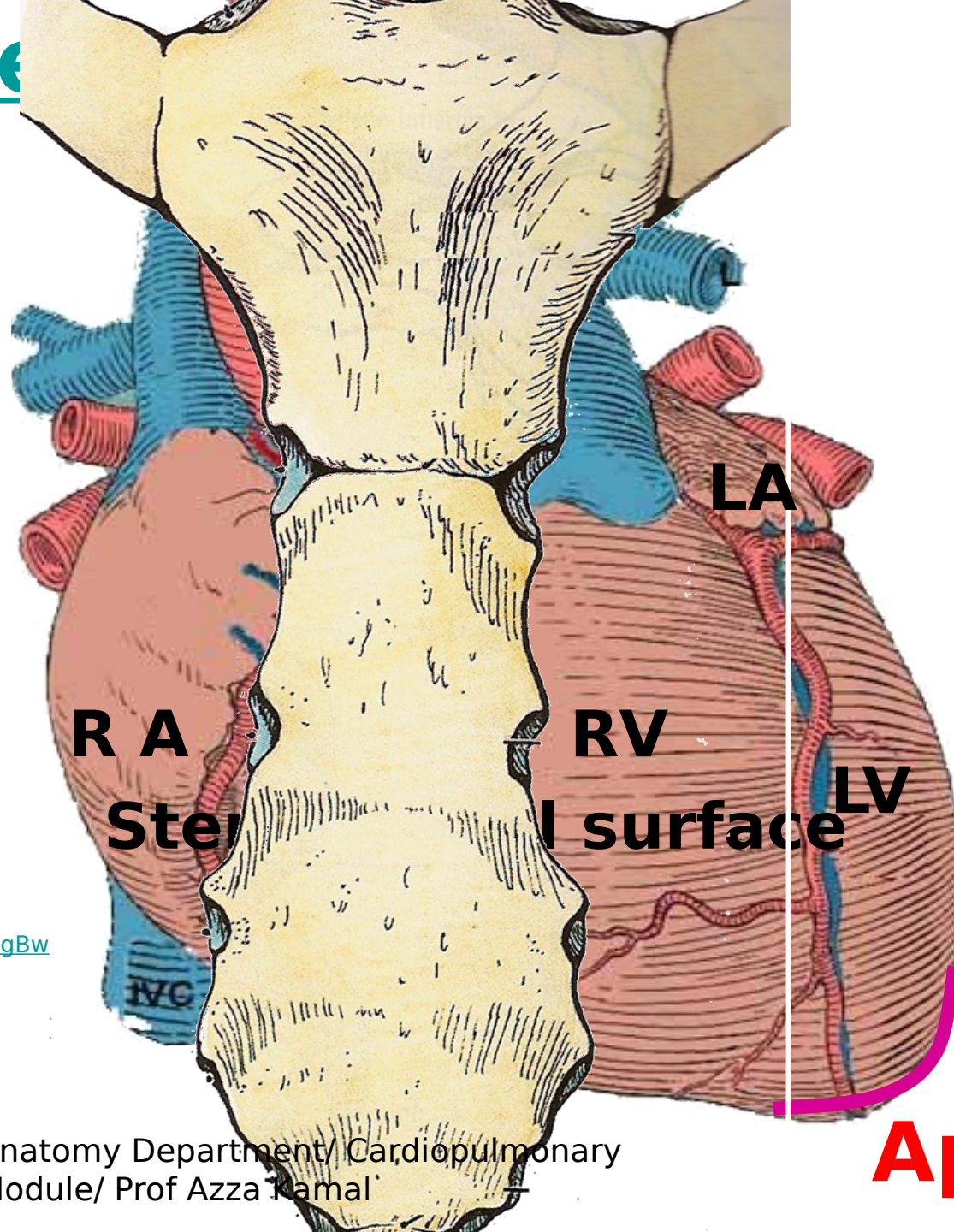
<https://lh3.googleusercontent.com/Pk7f96QHkQGK4vIGayYuPY>

**Base of  
Heart:**  
**directed**  
**posteriorly** □  
**formed by**  
**left atrium**  
**mainly** +  
**right atrium**





# Surfaces of the heart



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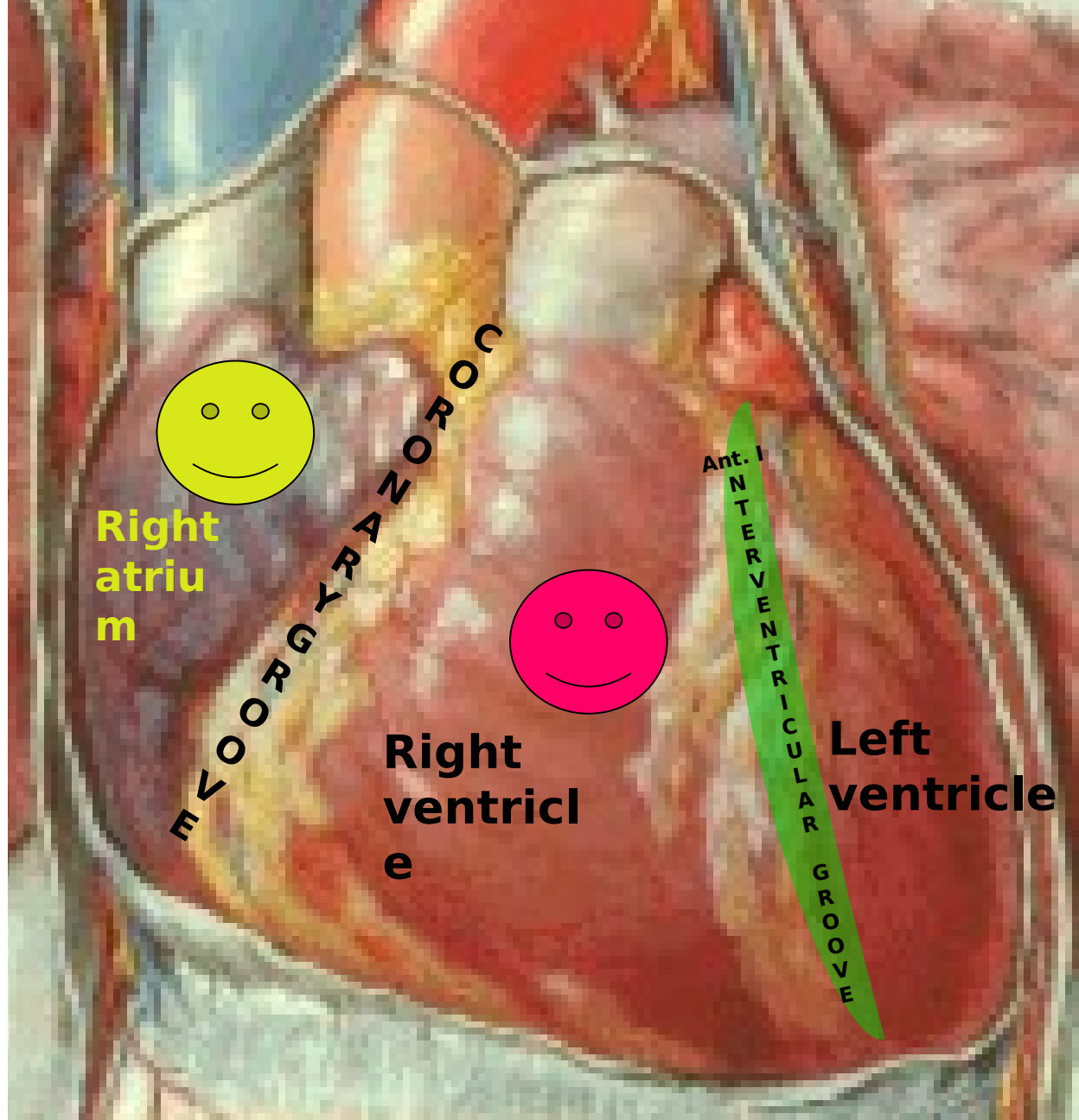
# SURFACES OF HEART

**1. Anterior (sternocostal) surface:** divided into □

Atrial & ventricular parts by **coronary groove (atrio-ventricular groove)**

(i) Atrial part □ right atrium

(ii) Ventricular part is divided by **anterior interventricular groove** into :





## B) Diaphragmatic

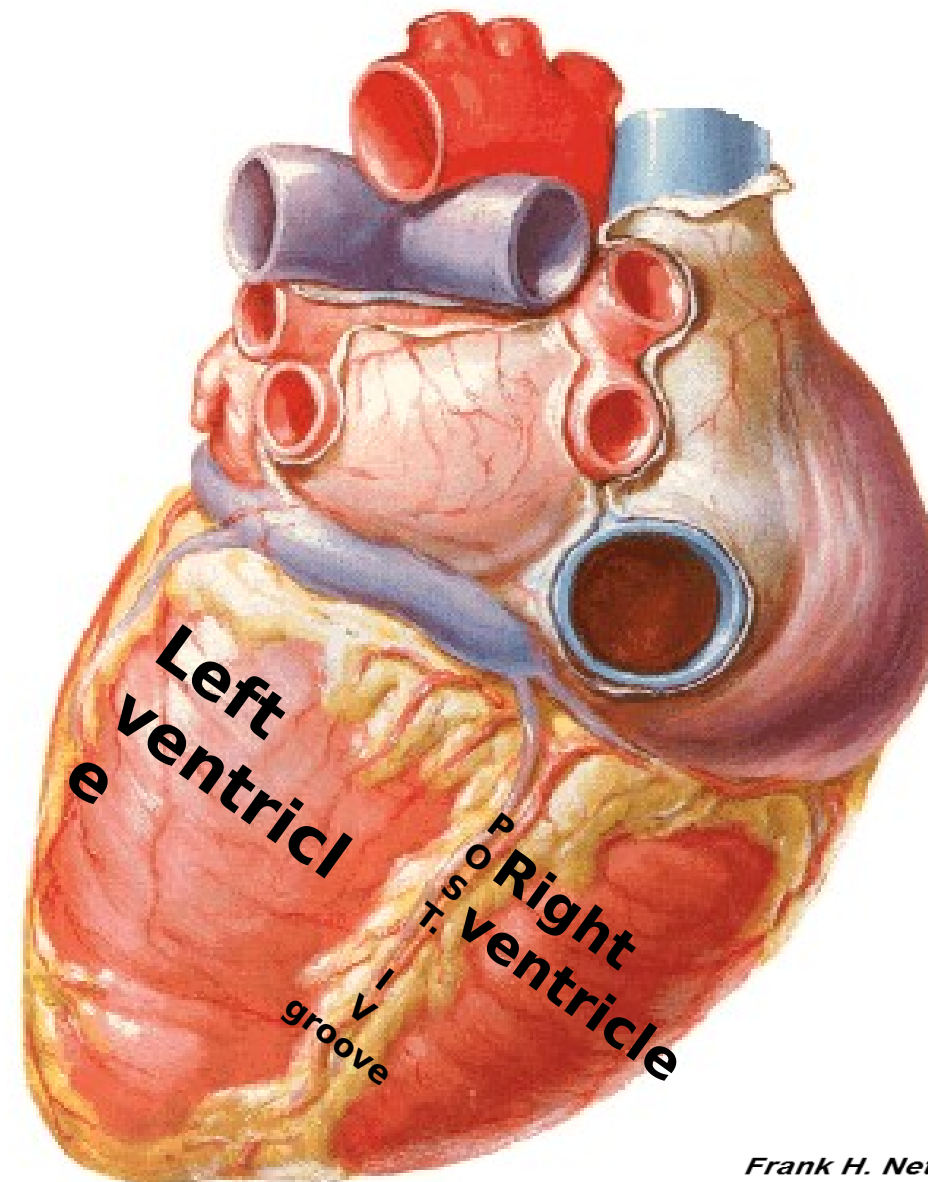
Surface

Formed by both ventricles.

Divided by posterior interventricular groove into:

1. Left 2/3 by left ventricle

2. Right 1/3 by right ventricle

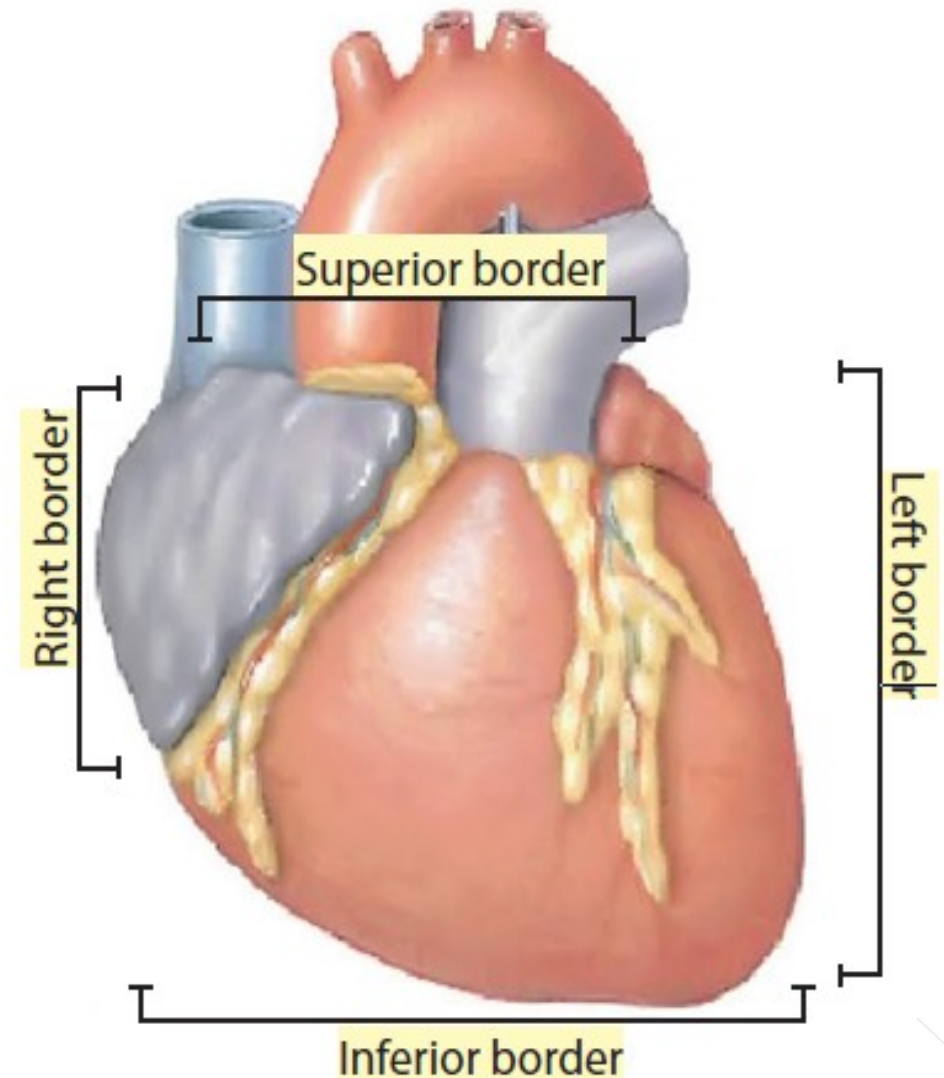


Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition



# Borders of the heart:

1. **Upper border** by both atria
2. **Right border** by right atrium
3. **Lower border** by right ventricle + apex (Lt ventricle)
4. **Left border** by left ventricle (+Lt auricle)



<https://lh3.googleusercontent.com/kTCTfj7k>



**The apex of the heart is formed by which of the following chambers?**

- a) Right atrium
- b) Right ventricle
- ☒ c) Left atrium
- d) Left ventricle
- e) Both ventricles

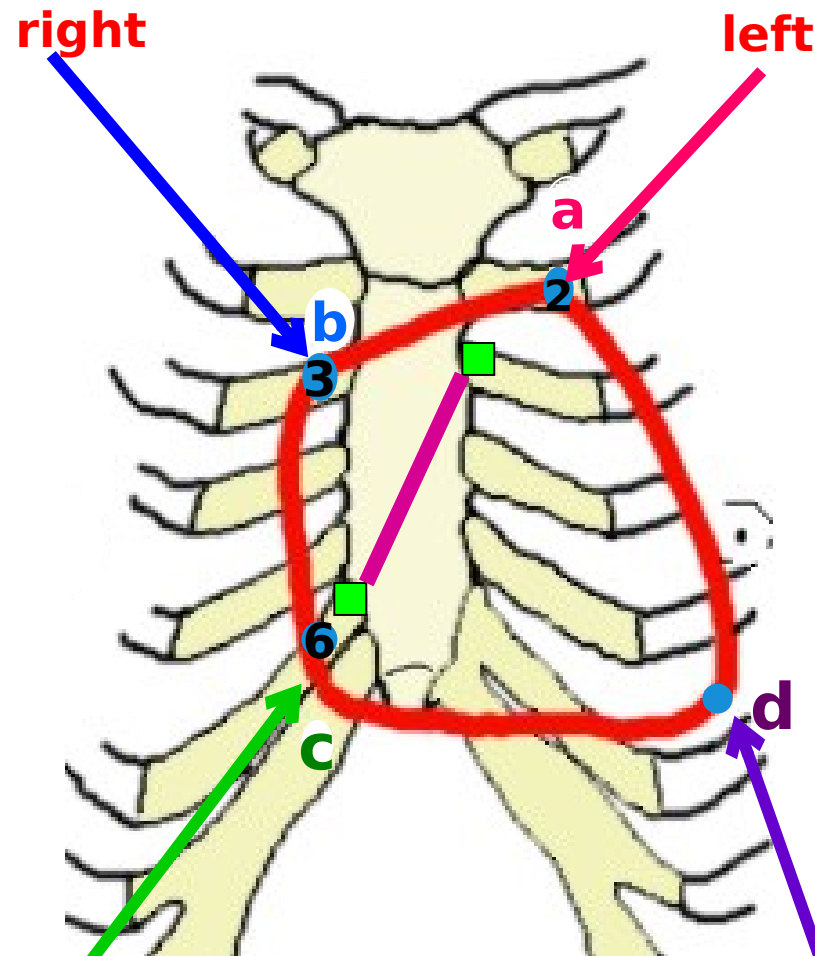


**MCQ to test position, surfaces and borders of the heart**



# Surface anatomy of the heart

- **Point a** □ 2<sup>nd</sup> left cc ( 1.25 cm from sternal margin)
- **Point b** □ 3<sup>rd</sup> right cc (1.25 cm from sternal margin)
- **Point c** □ 6<sup>th</sup> right cc ( 1.25 cm from sternal margin)
- **Point d** □ on left 5<sup>th</sup> intercostal space 9 cm from middle line (apex groove)



Atrioventricular (coronary) groove □ 3<sup>rd</sup> left cc to 6<sup>th</sup> right cc

**The apex of the heart lies in which of the following sites?**

- a) Right 5<sup>th</sup> intercostal space
- b) Left 6<sup>th</sup> intercostal space
- ☒ c) Left 5<sup>th</sup> intercostal space 9 cm from midline
- d) Left 5<sup>th</sup> intercostal space 9 inches from midline



**MCQ to test surface anatomy of the heart**

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# THANK YOU

***Suggested Textbook:***

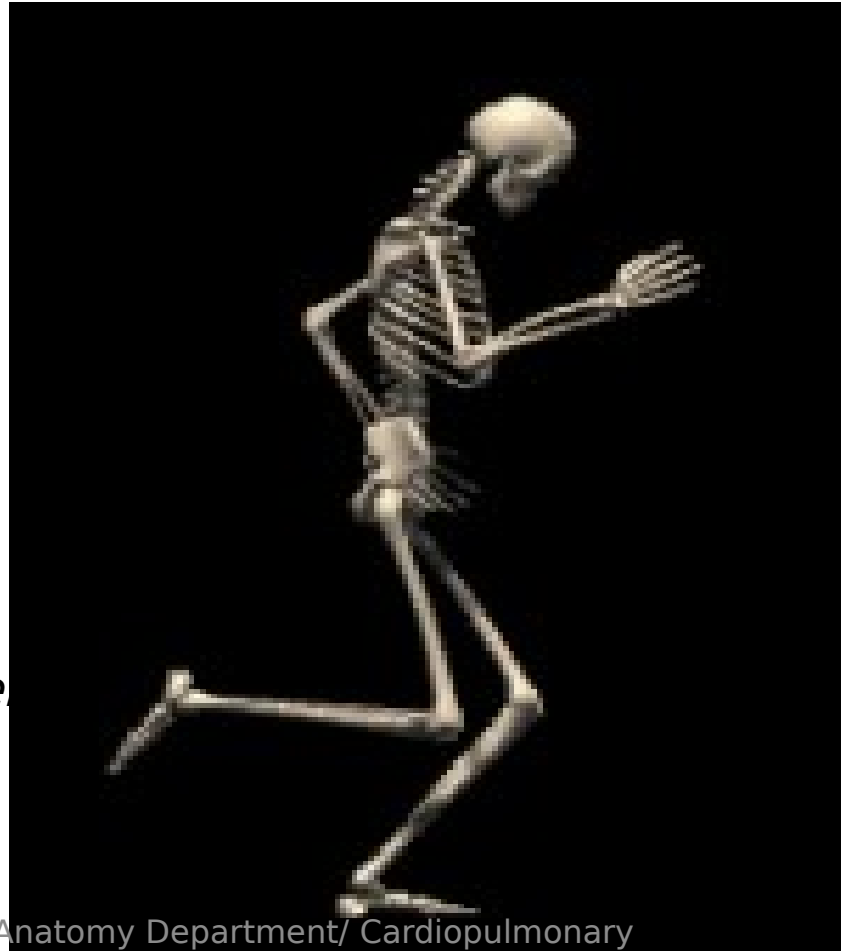
*Clinical Anatomy for Medical Students*

*Richard S. Snell*

*Pages 101-102*

*124- 125*

*137-138*



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